

# The Transfer of Adverse Clinical Events Rules with an Arden-Based Decision Support System

Joyce Sager, Ph.D., Roger Corman, David Daine, M.A., Jiang Wu, Ph.D.,  
Michael Yang, M.D., M.S., Nancy Thalman, Sheldon Wang, Ph.D.  
HealthVISION Corporation, Santa Rosa, CA

## INTRODUCTION

We have previously reported the development of a Clinical Decision Support (CDS) system that integrates with a clinical data repository.<sup>1</sup> We now present recent progress in using this system to provide decision support by targeting areas where substantial quality and cost benefits may be achieved. Studies have shown that adverse drug reactions and nosocomial infections are the two most frequent types of adverse events experienced by patients.<sup>2</sup> We have focused on these two areas. We have shown that non-Arden Syntax rules developed elsewhere are transferable and that external knowledge bases can be interfaced with our system through an Arden Syntax extension.

## NOSOCOMIAL INFECTION

Medical Knowledge Modules (MLMs) that monitor nosocomial infections are triggered when microbiology lab results enter the clinical data repository. When a nosocomial infection is detected, an alert is generated and stored in the patient record. Additionally, email can be sent to specified personnel. The process to develop this system included:

### *Knowledge Acquisition*

We consulted the literature and the experts in the area.<sup>3</sup> We selected the rules that have been evaluated and shown the ability to improve the quality of care or reduce costs. The rules were translated manually into MLMs using Arden Syntax.

### *Data Availability*

We mapped the data elements used by the rules with the data available in our repository. New data elements were added to accommodate the rules. HL7 messages were used to transfer the microbiology data and test the MLMs.

### *Triggering Events*

We analyzed the triggers need to evoke these MLMs efficiently. For performance reasons, triggering events were tightly controlled by an evoke table which monitors events and selects the appropriate MLMs to call.

## DRUG-DRUG INTERACTION

CDS supports the triggering of MLMs during interactive order entry and the display of the resulting conclusions to the user. We have implemented interfaces to third party drug databases in order to include drug-drug interaction checking as part of this process. To facilitate access to these external knowledge sources through APIs, we have proposed an extension to the Arden Syntax to support foreign function calls. Here is an example of calling a C-style function from our drug interaction MLM:

```
//Foreign function declaration
fDrugInt := INTERFACE(long
    DrugLib:DrugInteraction(char*));
// Get drug interactions;
nInt := call fDrugInt with(medOrder);
```

The extension has been implemented in our compiler. It will allow us to perform such functions as drug-allergy checking, dosage range checking, and expert dosing in the future.

## DISCUSSION

Real-time surveillance of nosocomial infections by CDS provides the opportunity of timely patient care and institution-wide prevention. We have shown that rules developed at research institutions are transferable to our commercial system using Arden Syntax. We have also shown that the proposed Arden extension has opened the door for MLMs to integrate with an array of other products. These efforts have greatly expanded the capability and usability of our Arden-Based CDS system.

## REFERENCES

1. Corman R, Sager J, Wu J, Wang S, Daine D, McEwan D. Arden-based clinical decision support in an object-oriented world. Proceedings of 1996 AMIA Fall Symposium 1996:873.
2. Brennan TA, Leape LL, Laird N, et al. Incidence of adverse events and negligence in hospitalized patients, results from the Harvard Medical Practice Study. N Engl J Med. 1991; 324:370-84.
3. Evans RS, Larsen RA, Burke JP, et al. Computer surveillance of hospital-acquired infections and antibiotic use. JAMA 1986;256:1007-11.